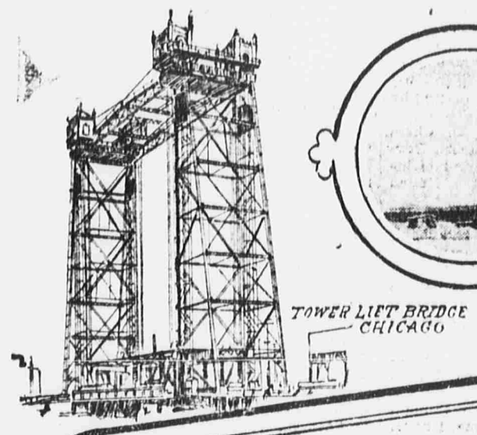
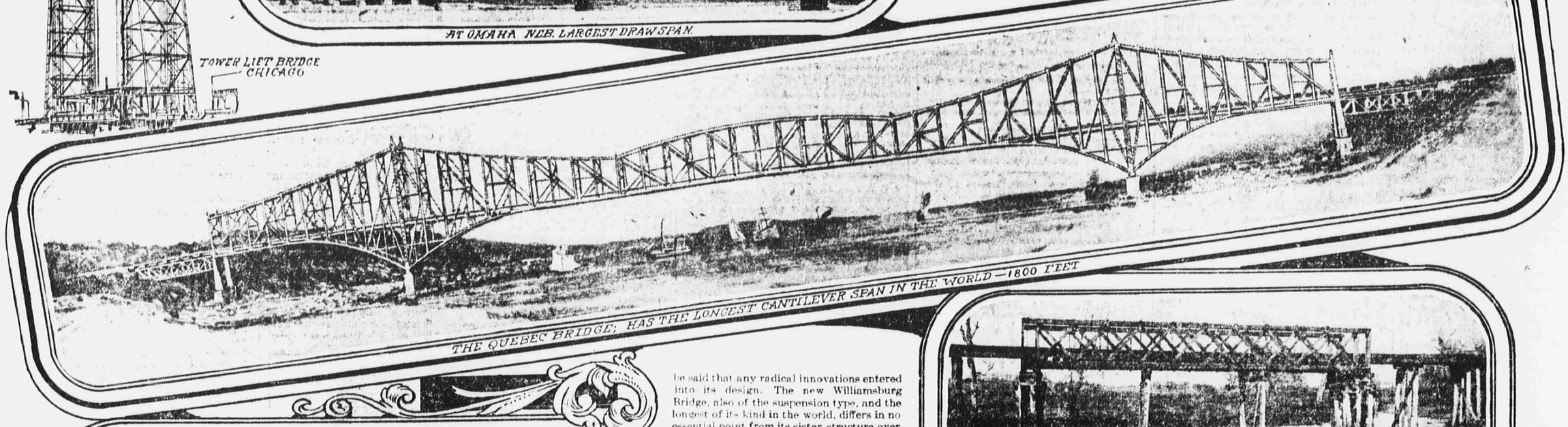
NOTABLE ACHIEVEMENTS OF AMERICAN BRIDGE BUILDERS

They Are Erecting the Bridge With the Longest Single Span at Quebec---The Longest Draw Span at Omaha---The Longest Bridge at Cairo, Ill.---New Inventions to Suit New Conditions---Improved Bridges for Railroads.

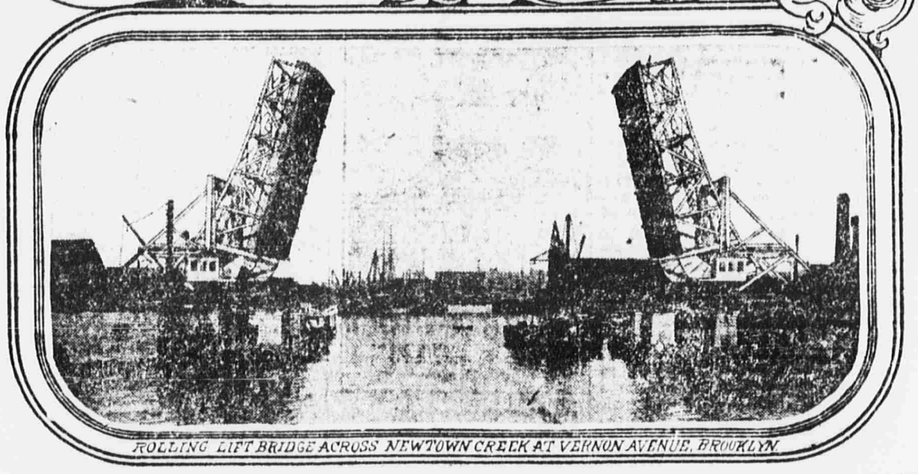


TOWER LIFT BRIDGE CHICAGO

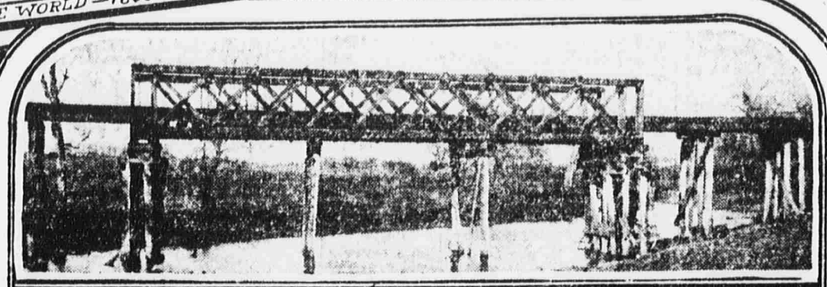
AT OMAHA NEB. LARGEST DRAW SPAN.



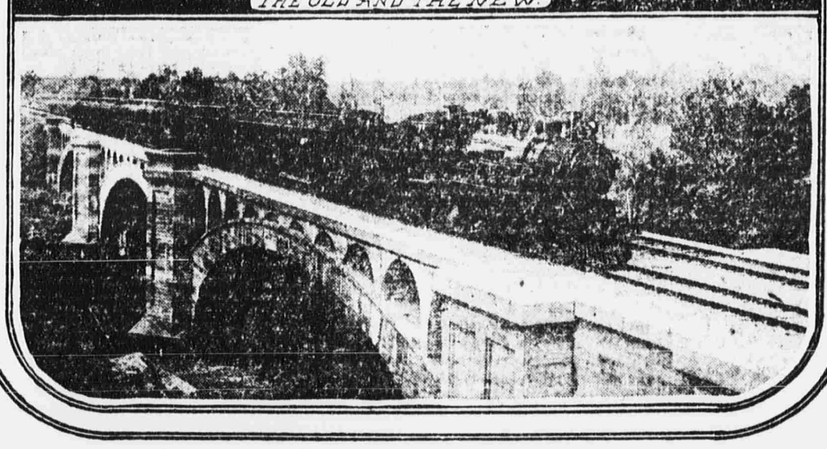
THE QUEBEC BRIDGE; HAS THE LONGEST CANTILEVER SPAN IN THE WORLD—1800 FEET



ROLLING LIFT BRIDGE ACROSS NEWTOWN CREEK AT VERNON AVENUE, BROOKLYN



THE OLD AND THE NEW.



The art of bridge building, or the science of it, if you will, is as old as the Roman Empire itself. Crude attempts to span streams and ravines were previously made but it remained for the Romans of Cæsar's time to erect structures of a permanent nature.

Their handiwork may still be seen in various parts of Europe. So it may be said that practically bridge building had its genesis with the Romans; and from their day to this none of the arts or industries of civilization has been more assiduously cultivated, and in none has a greater degree of perfection been attained.

The progress made, more especially within the last fifty years, is remarkable. We are all so accustomed to seeing the gigantic structures of steel and stone which cross rivers everywhere that we accept them as a matter of course, and we give scarce a thought to the ingenuity, the painstaking labor, the mechanical skill employed in their production, or to the immense sums of money expended on them. The Brooklyn Bridge, one of the most expensive structures in the world, cost about twenty-one million dollars. There are many others in the United States whose cost also ran up into the millions.

To the railroad must be given the credit for furnishing the impetus that has resulted in the marked advances of the past half century. Especially is this true in the United States, whose unprecedented growth would have been impossible without the aid of its transportation lines.

The railroads, in their constant endeavor to improve, their unceasing effort to give the American people a service unexcelled in the whole world for comfort, speed and cheapness, have so increased the weight of their rolling stock and train loads that the light structures which did service when the first transcontinental road penetrated to the Pacific Coast have become obsolete and utterly incapable of meeting the demands of standard modern carriers. Thus stronger and better bridges had to be built.

Co-extensive with the development of railroading has been that of the iron and steel industry. The two have cooperated in a transformation that is one of the marvels of the nineteenth and twentieth centuries.

America, the land of big things, possesses more striking examples of advanced bridge construction probably than any other country. It has the longest metallic structure across any river in the world—that over the Ohio River at Cairo, Ill., exceeding in length the renowned Tay Bridge in Scotland by 53 feet.

The Cairo bridge was finished in 1889. It is 10,780 feet—precisely two miles—in length, though originally, with the timber trestle approaches, which have since been filled in and replaced by solid embankments, there was almost four miles of continuous bridge work.

A bridge with the longest single span ever built is now being erected by an American firm across the St. Lawrence River six miles above Quebec. It is designed for both railway and wagon traffic and contains a central span 1,800 feet in length and 150 feet above the water, permitting the unobstructed passage of the largest vessels afloat.

Scotland's claim to preeminence in this respect is to be outdone, the celebrated Firth of Forth span being 90 feet shorter than that at Quebec. But while the Quebec bridge is of unusual height, it will not be the highest bridge in the world, that honor having fallen to a structure over the Zambesi River on the Cape-to-Cairo railroad in Africa, recently completed, which crosses the stream at a height of 420 feet.

In drawbridges, too, America leads the world. There was opened at Omaha this year a centre pier double drawbridge each swing span of which is 525 feet long.

This excessive length was necessary on account of the shifting channel of the Missouri River, which is constantly undergoing changes in its course, and the new bridge was designed to provide as much as possible for the future vagaries of the stream.

In the common types of steel bridges—the truss, the cantilever, the suspension, etc.—it cannot be said that there have been any extraordinary changes since these types were first introduced. Beyond being successively strengthened and improved in minor details so as to take care of the greater loads they are called upon to bear, these structures remain practically unaltered in their general outlines.

For instance, the Brooklyn Bridge, so familiar to New Yorkers and, indeed, to the country at large, was a noteworthy structure in its day, and is still so, though it cannot be said that any radical innovations entered into its design. The new Williamsburg Bridge, also of the suspension type, and the longest of its kind in the world, differs in no essential point from its sister structure over the East River, though more ornate and of heavier parts.

The Eads Bridge at St. Louis, the Niagara suspension bridge, the Victoria tubular bridge at Montreal and others that might be named, all old and famous structures, have as types hardly been improved upon. But the tubular bridge has disappeared, and most likely been relegated to the limbo of history, never to be reproduced under modern engineering practice.

Bridge engineers to-day confine themselves chiefly to the study of stresses and strains, the provision of maximum strength with the minimum use of material, and consequent minimum cost. Every pin or bolt that can be dispensed with is so much saved.

It is in the smaller bridges that the greatest changes have occurred in recent years. In movable structures over navigable waterways the development has been revolutionary in its nature.

The old style swing or draw bridge is being rapidly superseded, at least where the channels are not excessively wide, by the roller lift bridge, an improvement on the pivot bascule type which had its origin in the feudal days when the spans over castle moats were raised up on end to shut off communication with the outside world.

The original design of the roller lift consisted of two movable leaves that met in the centre of the stream and were rolled up and down from piers on either shore. Single-leaf draws, however, are now being built in many instances where this form of construction is best adapted to local conditions.

Its advantages over the centre-pier bridge are overwhelming, in that it leaves unobstructed the full width of the river or canal. Vehicles or cars cannot fall into the water when the lift is open to vessels. It is more rapid and economical of operation, saving delay and expense.

Again, one of the inherent limitations of the centre-pier swing bridge is the fact that it cannot be enlarged or widened to provide for additional parallel tracks without being entirely rebuilt, and additional bridges of this class cannot be built alongside because of the interference of their swing spans with each other. The bascule draw, on the contrary, operating vertically, can be duplicated as close and as often as need be to meet the demand for greater bridge facilities.

That necessity is the mother of invention was never demonstrated better than in the evolution of the roller lift bridge, which was designed especially to overcome the complicated conditions existing along the Chicago River.

This stream, always crowded with vessels large and small, winds its way through the very heart of the Western metropolis, intersecting the city's busiest thoroughfares. A continual blockade of both land and water traffic resulted from the obstruction of navigation by the centre-pier bridges and the delays due to opening and closing the cumbersome swing draws.

William Scherzer, a Chicago man, invented the roller lift bridge to meet these difficulties, and it is regarded as one of the greatest mechanical achievements of the day. Though in its infancy, the new style of structure has already been widely utilized, both in the United States and in foreign countries. There are a few of these bridges in the vicinity of New York, four having last summer been substituted for a like number of obstructive centre-pier swing bridges across Gowanus Canal, Brooklyn.

A new one across Newtown Creek at Vernon avenue, said to be the biggest of its sort in the country, was opened for service a few weeks ago. The big leaves are operated by electricity, and work as easily as if they weighed only a ton each, while they weigh more than 1,000 tons.

The leaves work on big rockers much like those of a rocking chair in shape, and are counterbalanced by weights of 1,250,000 pounds each. The arms can be raised in thirty seconds by the pressing of a lever which sets the machinery in motion.

The effort to provide clear and unobstructed channels in navigable waterways led to the design of another type of movable span—the tower lift bridge. One of these peculiar structures was erected by the city of Chicago at the Halsted street crossing of the Chicago River.

The entire floor of the bridge is lifted horizontally by power to a height that will permit of the tallest mast to pass underneath. But its first cost and the expense of operation are largely prohibitive as compared with the bascule.

Bridge engineers regard it as more of a freak than a successful, practical working device. It is said to be the only one ever built, and is looked upon as a national curiosity.

Like most mechanical contrivances of an experimental nature, this bridge has a faculty for getting out of order, usually at critical times; and many amusing stories are told of pedestrians who remained on the bridge when the vessel was approaching in order to enjoy the novelty of being taken to the top of the towers, and were obliged to stay poised between heaven and earth for hours and in some cases overnight, until the working gear was restored to activity and the bridge lowered. Food was furnished the unfortunate sensation seekers by means of pails and baskets raised and lowered by long ropes.

Concrete, reinforced by steel, is becoming more and more a popular material for the construction of permanent bridges over small streams and ravines. Their advantage over iron structures lies in their greater permanency, and in their economy both as to first cost and maintenance.

Graceful artistic effects are also possible, as will be seen by the accompanying picture of this type of structure. A striking contrast is afforded in the twin picture, "The old and the New," between the past and present methods in bridge building.

Of course there are many railroads that cannot afford the first cost of concrete or steel bridges, and are, perforce, obliged to cling to the timber structure; but the progressive up-to-date companies with money at their command, are rapidly substituting concrete masonry for the less stable timber work. Stone is, of course, still used largely where it is immediately available, but cement is more easily handled and of greater utility, besides being cheaper.

The ordinary form of modern bridge construction is known as the truss, and various modifications of the truss element (the rigid triangle) are in more general use than any other type of span up to, say, 350 feet in height. The common highway and railroad bridge is almost invariably a truss.

As long ago as the sixteenth century this form of bridge construction was first employed by an Italian, and his designs continued in use practically without modification for about 300 years, until the advent of iron and steel, when Howe, Pratt and other eminent American engineers introduced the improved forms of construction which to-day remain the standard of their types.

The first application of the truss principle to iron construction in the United States was in 1840. But it may be said that only within the last twenty-five or thirty years have the mathematical principles involved in truss construction been fully understood. Most of the earlier examples of bridge building were designed and executed by carpenters and mechanics ignorant of the scientific principles now applied to bridge construction.

PLUNGERS WHO WON AND LOST

MANY REGULARS PICKED WINNERS WITH FAIR SUCCESS.

Jack McDonald, Bill Cowen, Frank Tyler, Police Captain Diamond and Others Clean Up, While Gates, Dave Johnson, Lewisohn and Yeager Drop Thousands.

Who won the money on the racetracks of the Jockey Club this year? Nearly all of the plungers say they lost on the season, while a majority of the bookmakers say the same. Furthermore, many of these big operators have quit the game temporarily, but the racegoing public remained loyal to the sport of kings to the very last day of the metropolitan campaign. It is fair to assume, therefore, that these thousands of regulars who attended the races day in and day out since the opening of the schedule on the local tracks last April were reasonably successful at picking winners.

The study of public form was more widely practised this year than ever before, while the performances of the horses both in preparatory gallops and in actual races were looked into by the public with more than ordinary care and scrutiny. It was, on the whole, a decidedly difficult task to fool the rank and file of racegoers this year as to real form. Men who say they know whereof they speak declare that while the average patron is a small and conservative player, he has not only made a good living at the game, but has also been able to put away a nice balance to keep him through the winter months.

A racetrack regular, one who sees every race run here each season, in all sorts of weather and on all kinds of tracks, a most particular person as to the method of betting his wealth and also as to the magnet for his wagers, he wants to know before he wagers his money whether the horse he has selected is fit and ready, also whether the "right money" is down. He watches the warming up gallop, has the "dope" of past performances at his finger tips and then he goes into the ring to find out if the wise men bet or not. In other words, it is a most difficult task to keep good things away from these keen eyed individuals, who read every line of racing information published, believe half what they hear and are as much up to date as the wisest man on the racecourse.

"The regulars have had a great season," was the way a leading bookmaker put it to THE SUN man the other day. "I do not mean the big guns over in the clubhouse altogether, but the public at large, or rather that part of it that gives its undivided time, attention and money to the support of the turf. Many persons who used to play Wall Street have turned to racing. Hundreds of men and women make a living out of the tracks, some of them being ahead on the season to the extent of $5,000 or even $10,000. If these people were constantly losing money on the horses they would not keep coming to the tracks. They could not afford it, and would soon give up the game as a bad job. No, the public has not gone broke this year, as many well known layers can prove."

John E. McDonald, bookmaker, plunger and man about town, has been very successful this year. He is $200,000 to the good and expects to enjoy a particularly comfortable winter. McDonald is a cool headed, wise, conservative player, who believes in betting a bunch on the horse he likes. He has made a record with long shots and has earned a large and loyal following. McDonald is an excellent judge of a horse's form, but he also believes in paying for information. He has a lot of poor owners on his staff and from them he secures the betting privileges when their horses start ready to carry off the large end of the purse. McDonald is a veteran. He has travelled all over Europe and is well known and highly regarded among sporting men.

Unlike McDonald, Dave Johnson has lost more than $150,000 to the bookmakers. According to his own statements, he won $100,000 on Roseben's victories since the great sprinter finished his last winter's campaign at Hot Springs, but he burned up this amount betting on other horses. Johnson is not a conservative player. On the contrary, he is an erratic, nervous, superstitious plunger, who will fall for almost any kind of a tip or hunch. He is a natural born gambler and a game loser. In the hour of success Johnson's heart is well in evidence, for he is liberal to a fault.

Many times when jockeys rode winners for him Johnson made them handsome presents as a token of his esteem and gratitude. But when he went to the wall it was on a "sure thing"—Roseben met Jocund at Sheepshead Bay on August 31, and was beaten. On that occasion Roseben was a prohibitive choice at 1 to 4, yet Johnson bet $15,000 on him. The defeat practically broke the plunger, who retired temporarily. He was back again with another bankroll when the fall meeting at Belmont Park opened, but soon he bet his last $10,000 on Sir Tristan, a maiden two-year-old who was badly beaten. Johnson has been seen at the track only one day since, and that was at Aqueduct, where he had no success.

While Johnson is a big loser, John W. Gates is said to head the list in this respect. He is the heaviest individual loser of the year, the figures being placed at $250,000. Gates is a spectacular plunger. With Boots Durnell and Enoch Wishard training horses which were generally attractive betting propositions, Gates plunged on them time after time, without limit. On Brother Frank in two consecutive races Gates lost $60,000 alone. His commissioners, Charles Head Smith and Frank Moore, received instructions at times to bet as much as the bookmakers would accept, as there was no check to the amount. Gates, however, cares nothing for these setbacks, as he will have a powerful stable of his own next year and Durnell will train for him.

John A. Drake, another heavy speculator, was an extensive loser during the early part of the campaign, but in order to get out of his predicament he purchased a number of horses and turned them over to Wishard who dropped them into overnight events under conditions that made success for them practically a certainty. Then Drake sent it in for large amounts and succeeded in breaking something like even on the year, although some people say that he finished behind.

Jesse Lewisohn has had a disastrous year. In fact, he has never experienced anything like it before in his career as a turf speculator. In spite of the fact that he is a close friend of the shrewd David Gideon, Lewisohn has not nothing but a series of shocking reverses. There was a flash of good luck during the summer meeting at Brighton Beach, when the young millionaire won $60,000 on three races in one afternoon, but that was a mere bagatelle. When he told his friends at the conclusion of the Jamaica meeting that he had retired for the season it was correctly estimated that he had dropped about $200,000 on the year. Lewisohn played form and information, but in many instances his judgment was warped by prejudice.

David Gideon also experienced a rough journey in the way of selecting winners. He has enjoyed the reputation for years of being one of the cleverest, shrewdest, slickest turf manipulators in the business. There was a time when it seemed as if everything he bet on turned into a gold mine, but with Lewisohn's hard luck overshadowing his own fortunes, Gideon's path has not been a bed of roses. If he has gotten away with less than a $50,000 deficit he is lucky.

How much has George Wheelock, the former president of the Metropolitan Turf Association, dropped? Some put it at $100,000, while others increase the figures. Wheelock, who tired of actual bookmaking two years ago, began this year with a great splurge. He could not lose a bet, and when the spring meeting at Belmont Park was under way he was $60,000 to the good. Then came the trouble between the Mets and the racetrack owners, in which Wheelock's organization received a severe throwdown when the betting ring was declared open. Wheelock was worried beyond measure over this unexpected turn of affairs, and as he found that he could not pull the boasted stroke with the powers that be he was soon on the verge of a nervous breakdown. He went away for a rest shortly after the Futurity was run, and it was then reported on excellent authority that he was $150,000 to the bad.

Later Wheelock got into something like his old stride and he won $25,000 on Hermitage in a race at Aqueduct. Wheelock, it is said, is really weary of the horse racing game, now that he is no longer the leader of the Mets, and as he threatens to indulge in other pursuits the turf may lose him. It was not so many years ago that Wheelock lived in St. Louis, where he occasionally played craps and other innocent games. Lucky Baldwin took a fancy to him and not long afterward Wheelock began to climb the ladder of fame and fortune. He is now a millionaire, owns a house in West Eighty-sixth street and has several big automobiles.

William Cowen, member of the Mets, a quiet, daring and yet wise bookmaker, was $300,000 winner on booking alone up to the fall meeting at Belmont Park. Then he reduced the volume of his business and became what is known as a piker. One of the biggest bets Cowen took and won this year was that of $25,000 on Beldame, wagered by Charles Head Smith to win $8,000, the day that Agile beat the great mare in the Advance Stakes at the Bay last June. Cowen has always been the man to accommodate the biggest bettors, but he is one of the few layers who refuse persistently to put up prices on steeplechases.

Leo Mayer, the Western bookmaker, and a solid one at that, was a $100,000 winner up to the Saratoga meeting, but after that he dropped half that amount before he quit. Foie Pearsall can retire for the winter with $100,000 in winnings, including coups at long odds of the Cederstrome kind. Abe Levy is not in this class, however, for when he returned from Europe this fall he began making book at Jamaica, and when Aqueduct closed on Wednesday a $50,000 hole had been dug in his bank roll.

Louis Snell, bookmaker, who is going to spend the winter touring the Far East, cleaned up $175,000 at least on the year. He made a straight book and refrained for the most part from playing the horses himself. Harry McKenna, another bookie, did almost as well, but he bet extensively.

Several years ago George Langdon, then a betting commissioner, had a streak of good fortune and ran a shoe string into a small fortune. The young man then trailed along with fair success until the early part of this season, when things broke badly for him and he seemed unable to pull himself together. When the Belmont Park fall meeting was under way Langdon was $75,000 in the hole. But his friends, and they are numerous, did not hurry him about his debts, and the whole racetrack, it might be said, rooted for him. At last came the turning point. Langdon bet $50 on a horse and won. Then he went on picking winners until he soon paid off $40,000 in debts and got well upon his feet. As luck continued his way he bought a couple of horses and is now ready for a campaign at Los Angeles.

Joe Yeager, the "Boy Plunger," is still figuring up his losses, it is generally supposed. There was a time when Yeager was betting $5,000 to a race, and in some cases $10,000 and $15,000. But by the time the Suburban Handicap was run this year Yeager was in dire straits. Instead of a plunger, Yeager soon became only a moderate player, as his bets were seldom more than $500. When Hildebrand the jockey lost his license Yeager received another blow, from which he did not recover for the rest of the season.

Sol Lichtenstein, the veteran layer, known as the "King of the Ring," did not win his usual pile, probably for the reason that he continued to wager heavily on the horses at all stages. Sol has always been a player of favorites or second choices and his wagers have not gone above the $3,000 mark. His brother, known as the Counsellor, generally followed in his footsteps as to judgment and the size of wagers.

Frank Tyler, the Humming Bird, wound up the campaign $125,000 to the good. Though not a member of the Mets, he proved to be a thorn in the flesh of the layers' organization, and when he got into the front line as the leader of the invaders he made things hum. Tyler made his own prices on a liberal scale and also took chances with the heaviest kind of wagers. He also bet extensively on the side with marked success. One of his hobbies was to lay against favorites, which he did with rare judgment at an immense profit.

E. E. Smathers, when he decided to sell his stable, was a tremendous loser. From the time that he purchased McChesney and Dick Bernard for $38,000 Smathers seemed to encounter a run of particularly hard luck until, it was said, he was all of $300,000 in the hole. But after the sale he began to recoup with careful playing and managed to recover about half this amount.

Chicago O'Brien, called "the cinch player," got away with a fat bank roll. O'Brien played more horses out on the limb or rather to show than any other speculator on the turf. He was satisfied to take 1 to 4 against a favorite third rather than to play him straight at 8 to 5. In that way his percentage of winning bets was large and his success almost without a break, although there were several occasions when he went down with a dull thud.

Then we have George Rose, a millionaire bookmaker and part owner of the Los Angeles track. He booked with good judgment and a fat bank roll and finished far ahead of the game. Joe Ullman, who ran the "Big Store" book several years ago with Kid Weller, was another good winner. Henry Harris, Bill Jackman, Jim Davey, Max Blumenthal, John Fay, Joe Rose and John Coleman, all bookmakers, wound up with solid bank accounts.

At one time Davey, who came here from the West, was betting more money to each race than any other man on the track. But he let down at Belmont Park in the fall, well satisfied with the general result. Eddie Burke, the new leader of the Mets, did not enjoy his usual success, and for a time did not book at all. Orlando Jones and Joe Vendig operated their books on a comparatively small scale and took no chances.

Al Dryer, a close friend of Drake and Gates, was a big loser when the season was half over, but he managed to do well enough toward the close to break even. Mattie Cerbett got the money. He did all of his playing from the clubhouse veranda, and missed few live ones. Former Police Captain Diamond won $150,000, using a system peculiarly his own. He is one of the best handicappers on the turf, and had backbone enough to stick to his own business and opinions. He will go abroad this winter with his family, and says that playing the horses beats police business all hollow.

L. V. Bell has won big money during the last two months, backing the horses trained by J. H. McCormick. Sim Deimel, a follower of Jack Joyner's stable, is a substantial winner, and so is lucky Jack McGinnis, who owns a shifty stable and generally knows what is going on. Senator William H. Reynolds had a good year, but Senator P. H. McCarren did not do so well. Neither did Congressman Timothy D. Sullivan, who finished about $75,000 behind. E. R. Thomas played in a desultory manner with indifferent success, but Frank Farrell cleaned up handsomely. John Walters, the well known clubhouse commissioner, was many thousands to the good before the Saratoga meeting began, but near the close he found winners to be as scarce as the proverbial hen's teeth. Billy DuBois, also a clubhouse operator, was hit hard at times, and Dick Doggett lost so much at the fall session at Belmont Park and Jamaica that he declined to operate in the clubhouse at Aqueduct. Ed Stutte, owner of Sidney C. Love, went to the winter tracks with plenty of money, but Charley Fox, after a hard road, sailed the other day for Egypt.